



SEQUENCE LISTING

<110> Kim, Jihyun Francis  
Beer, Steven V.

<120> HYPERSENSITIVE RESPONSE ELICITOR FROM ERWINIA AMYLOVORA  
AND ITS USE

<130> 19603/3286

<140> 09/596,958

<141> 2000-06-20

<150> 09/120,927

<151> 1998-07-22

<150> 60/055,108

<151> 1997-08-06

<160> 10

<170> PatentIn Ver. 2.1

<210> 1

<211> 1344

<212> DNA

<213> Erwinia amylovora

<400> 1

```
atgtcaattc ttacgcttaa caacaatacc tcgtcctcgc cgggtctgtt ccagtccggg 60
ggggacaacg ggcttggtgg tcataatgca aattctgcgt tggggcaaca acccatcgat 120
cggcaaacca ttgagcaaatt ggctcaatta ttggcggaac tgtaaagtc actgctatcg 180
ccacaatcag gtaatgcggc aaccggagcc ggtggcaatg accagactac aggagttggt 240
aacgctggcg gcctgaacgg acgaaaaggc acagcaggaa cactccgca gtctgacagt 300
cagaacatgc tgagtgaat gggaacaac gggctggatc aggccatcac gcccgatggc 360
cagggcggcg ggcagatcgg cgataatcct ttactgaaag ccatgctgaa gcttattgca 420
cgcgatgatg acggccaaag cgatcagttt ggccaacctg gtacgggcaa caacagtgcc 480
tcttccggta cttcttcate tggcggttcc ccttttaacg atctatcagg ggggaaggcc 540
ccttccggca actccccttc cggcaactac tctcccgtca gtaccttctc acccccatcc 600
acgccaacgt cccctacctc accgcttgat ttcccttctt ctcccaccaa agcagccggg 660
ggcagcacgc cggtaacgca tcatcctgac cctgttggtg gcgcgggcat cggggccgga 720
aattcggtgg ccttcaccag cgccggcgct aatcagacgg tgctgcatga caccattacc 780
gtgaaagcgg gtcaggtgtt tgatggcaaa ggacaaacct tcaccgccgg ttcagaatta 840
ggcgatggcg gccagtctga aaaccagaaa ccgctgttta tactggaaga cggtgccagc 900
ctgaaaaaac tcaccatggg cgacgacggg gcggatggta ttcattctta cggtgatgcc 960
aaaatagaca atctgcacgt caccaacgtg ggtgaggacg cgattaccgt taagccaaac 1020
agcgcgggca aaaaatccca cggtgaaatc actaacagtt ccttcgagca cgcctctgac 1080
aagatcctgc agctgaatgc cgatactaac ctgagcgttg acaacgtgaa ggccaaagac 1140
```

RECEIVED

APR 25 2003

TECH CENTER 1600/2900

```

tttgggtactt ttgtacgcac taacggcggt caacagggta actgggatct gaatctgagc 1200
catatcagcg cagaagacgg taagtctctg ttcgttaaaa gcgatagcga ggggctaaac 1260
gtcaataacca gtgatatctc actgggtgat gttgaaaacc actacaaagt gccgatgtcc 1320
gccaacctga aggtggctga atga 1344

```

<210> 2

<211> 447

<212> PRT

<213> *Erwinia amylovora*

<400> 2

```

Met Ser Ile Leu Thr Leu Asn Asn Asn Thr Ser Ser Ser Pro Gly Leu
  1             5             10             15

Phe Gln Ser Gly Gly Asp Asn Gly Leu Gly Gly His Asn Ala Asn Ser
      20             25             30

Ala Leu Gly Gln Gln Pro Ile Asp Arg Gln Thr Ile Glu Gln Met Ala
      35             40             45

Gln Leu Leu Ala Glu Leu Leu Lys Ser Leu Leu Ser Pro Gln Ser Gly
      50             55             60

Asn Ala Ala Thr Gly Ala Gly Gly Asn Asp Gln Thr Thr Gly Val Gly
      65             70             75             80

Asn Ala Gly Gly Leu Asn Gly Arg Lys Gly Thr Ala Gly Thr Thr Pro
      85             90             95

Gln Ser Asp Ser Gln Asn Met Leu Ser Glu Met Gly Asn Asn Gly Leu
      100            105            110

Asp Gln Ala Ile Thr Pro Asp Gly Gln Gly Gly Gly Gln Ile Gly Asp
      115            120            125

Asn Pro Leu Leu Lys Ala Met Leu Lys Leu Ile Ala Arg Met Met Asp
      130            135            140

Gly Gln Ser Asp Gln Phe Gly Gln Pro Gly Thr Gly Asn Asn Ser Ala
      145            150            155            160

Ser Ser Gly Thr Ser Ser Ser Gly Gly Ser Pro Phe Asn Asp Leu Ser
      165            170            175

Gly Gly Lys Ala Pro Ser Gly Asn Ser Pro Ser Gly Asn Tyr Ser Pro
      180            185            190

```

Val Ser Thr Phe Ser Pro Pro Ser Thr Pro Thr Ser Pro Thr Ser Pro  
 195 200 205

Leu Asp Phe Pro Ser Ser Pro Thr Lys Ala Ala Gly Gly Ser Thr Pro  
 210 215 220

Val Thr Asp His Pro Asp Pro Val Gly Ser Ala Gly Ile Gly Ala Gly  
 225 230 235 240

Asn Ser Val Ala Phe Thr Ser Ala Gly Ala Asn Gln Thr Val Leu His  
 245 250 255

Asp Thr Ile Thr Val Lys Ala Gly Gln Val Phe Asp Gly Lys Gly Gln  
 260 265 270

Thr Phe Thr Ala Gly Ser Glu Leu Gly Asp Gly Gly Gln Ser Glu Asn  
 275 280 285

Gln Lys Pro Leu Phe Ile Leu Glu Asp Gly Ala Ser Leu Lys Asn Val  
 290 295 300

Thr Met Gly Asp Asp Gly Ala Asp Gly Ile His Leu Tyr Gly Asp Ala  
 305 310 315 320

Lys Ile Asp Asn Leu His Val Thr Asn Val Gly Glu Asp Ala Ile Thr  
 325 330 335

Val Lys Pro Asn Ser Ala Gly Lys Lys Ser His Val Glu Ile Thr Asn  
 340 345 350

Ser Ser Phe Glu His Ala Ser Asp Lys Ile Leu Gln Leu Asn Ala Asp  
 355 360 365

Thr Asn Leu Ser Val Asp Asn Val Lys Ala Lys Asp Phe Gly Thr Phe  
 370 375 380

Val Arg Thr Asn Gly Gly Gln Gln Gly Asn Trp Asp Leu Asn Leu Ser  
 385 390 395 400

His Ile Ser Ala Glu Asp Gly Lys Phe Ser Phe Val Lys Ser Asp Ser  
 405 410 415

Glu Gly Leu Asn Val Asn Thr Ser Asp Ile Ser Leu Gly Asp Val Glu  
 420 425 430

Asn His Tyr Lys Val Pro Met Ser Ala Asn Leu Lys Val Ala Glu  
 435 440 445

<210> 3  
 <211> 31  
 <212> DNA  
 <213> *Erwinia amylovora*

<220>  
 <221> unsure  
 <222> (8)  
 <223> n at any position is unknown

<400> 3  
 cggaaccnnn ncnnnnnnnn nccactcaa t

31

<210> 4  
 <211> 242  
 <212> PRT  
 <213> *Fusarium solani* f. sp. pisi

<400> 4  
 Met Lys Phe Thr Ala Ala Phe Val Ala Ala Leu Val Gly Thr Ser Ser  
 1 5 10 15

Ala Ala Val Thr Lys Thr Leu Pro Lys Ser Ala Gly Ala Thr Ser Phe  
 20 25 30

Pro Thr Ala Val Pro Val Lys Gly Ser Tyr Asp Gly Gly Met Lys Arg  
 35 40 45

Phe Glu Arg Glu Pro Lys Val Cys Lys Gly Gln Asp Glu Thr Gly Glu  
 50 55 60

Lys Asp Ala Met Phe Ile Leu Glu Asn Gly Ala Thr Leu Ser Asn Val  
 65 70 75 80

Ile Ile Gly Ala Ser Gln Ala Glu Gly Val His Cys Lys Gly Thr Cys  
 85 90 95

Thr Leu Asn Asn Val Trp Trp Ala Asp Val Cys Glu Asp Ala Val Thr  
 100 105 110

Leu Lys Gln Thr Ser Gly Thr Ser Tyr Ile Asn Gly Gly Gly Ala Phe  
 115 120 125

His Ala Ser Asp Lys Ile Ile Gln Phe Asn Gly Arg Gly Thr Val His  
 130 135 140

Val Lys Asp Phe Tyr Ala Glu Asp Tyr Gly Lys Leu Ser Arg Ser Cys  
 145 150 155 160

Gly Asn Cys Lys Asp Asn Gly Gly Pro Arg Asn Val Ile Val Glu Asn  
 165 170 175

Ser Val Ala Val Asp Gly Gly Val Leu Cys Gly Ile Asn Thr Asn Tyr  
 180 185 190

Gly Asp Thr Cys Lys Val Ile Asn Ser Cys Gln Asp Lys Gly Lys Tyr  
 195 200 205

Cys Asp Arg Tyr Glu Gly Asn Ser Ser Gly Lys Glu Pro Thr Lys Ile  
 210 215 220

Gly Ser Gly Pro Asp Gly Lys Tyr Cys Thr Val Thr Gly Ser Thr Thr  
 225 230 235 240

Ser Cys

<210> 5

<211> 244

<212> PRT

<213> Fusarium solani f. sp. pisi

<400> 5

Met Lys Ala Ser Ala Leu Ile Ile Ala Ala Val Thr Gly Ala Ser Ala  
 1 5 10 15

Ala Val Thr Thr Val Leu Pro Ala Ser Ala Gly Val Gln Ser Glu Pro  
 20 25 30

Thr Ala Ile Pro Val Arg Lys Gly Asp Lys Tyr Asn Gly Gly Met Lys  
 35 40 45

Arg Phe Val Arg Asn Pro Thr Thr Cys Lys Asp Gln Tyr Glu Thr Gly  
 50 55 60

Glu Lys Asp Ala Ser Phe Ile Leu Glu Asp Gly Ala Thr Leu Ser Asn  
 65 70 75 80

Val Ile Ile Asp Arg Ser Ser Gly Glu Gly Val His Cys Lys Gly Thr  
 85 90 95

Cys Thr Leu Asn Asn Val Trp Trp Ala Asp Val Cys Glu Asp Ala Ala  
 100 105 110

Thr Phe Lys Gln Lys Ser Gly Thr Ser Thr Ile Asn Gly Gly Gly Ala  
 115 120 125

Phe Ser Ala Gln Asp Lys Val Leu Gln Phe Asn Gly Arg Gly Thr Leu  
 130 135 140

Asn Val Asn Asp Phe Tyr Val Gln Asp Tyr Gly Lys Leu Val Arg Asn  
 145 150 155 160

Cys Gly Asn Cys Glu Gly Asn Gly Gly Pro Arg Asn Ile Asn Ile Lys  
 165 170 175

Gly Val Val Ala Lys Asn Gly Gly Glu Leu Cys Gly Val Asn His Asn  
 180 185 190

Tyr Gly Asp Val Cys Thr Ile Thr Asp Ser Cys Gln Asn Lys Gly Lys  
 195 200 205

Ser Cys Gln Ala Tyr Thr Gly Asn Asp Gln Lys Lys Glu Pro Pro Lys  
 210 215 220

Phe Gly Pro Ala Gly Asp Asn Gly Lys Ser Cys Leu Val Lys Ser Leu  
 225 230 235 240

Arg Thr Asn Cys

<210> 6

<211> 215

<212> PRT

<213> Fusarium solani f. sp. pisi

<400> 6

Met Ala Cys Leu Gly Tyr Thr Gly Gly Val Pro Lys Pro Thr Asp His  
 1 5 10 15

Ile Ser Asn Ser Lys Val Ile Glu Val Lys Ala Gly Gln Val Tyr Asp  
 20 25 30

Gly Lys Trp Ala Lys Tyr Asp Arg Gly Ser Gly Ala Cys Lys Gly Gln  
 35 40 45

Asn Glu Gly Gly Asp Lys Asp Ala Val Phe Leu Leu His Glu Gly Ala  
 50 55 60

Thr Leu Lys Asn Val Ile Ile Gly Lys Asp Gln Ser Glu Gly Val His

65		70		75		80
Cys Lys Gly His Cys Thr Leu Glu Phe Val Trp Phe Glu Asp Val Cys						
		85		90		95
Glu Asp Ala Ile Ser Ile Ala Gly Lys Glu Ser Trp Ile Ile Gly Gly						
		100		105		110
Gly Ala Tyr His Ala Ser Asp Lys Val Val Gln His Asn Gly Cys Gly						
		115		120		125
Thr Val Asn Ile Ile Asn Phe Tyr Val Glu Asp Tyr Gly Lys Leu Tyr						
		130		135		140
Arg Ser Cys Gly Asn Cys Ser Lys Gln Cys Lys Arg Asn Val Tyr Ile						
		145		150		155
Glu Gly Val Thr Ala Lys Asn Gly Gly Glu Leu Ala Gly Ile Asn Ala						
		165		170		175
Asn Tyr Gly Asp Thr Ala Thr Leu Lys Asn Val Cys Ala Asp Ala Lys						
		180		185		190
Gln Lys Cys Thr Met Tyr Asn Gly Cys Ala Gly Gly Cys Glu Pro Lys						
		195		200		205
Lys Ile Gly Ala Cys Pro Ala						
		210		215		

<210> 7

<211> 217

<212> PRT

<213> Fusarium solani f. sp. pisi

<400> 7

Met Ala Cys Leu Gly Tyr Thr Gly Gly Val Pro Lys Ala Thr Gly Ser														
1			5				10						15	
Lys Ser Leu Ser Ala Pro Lys Thr Leu Lys Lys Gly Glu Val Phe Asp														
			20				25						30	
Ala Gly Trp Val Arg Tyr Asp Arg Gly Val Lys Cys Ser Gly Gln Ala														
			35				40						45	
Glu Gly Gly Ser Lys Asp Ala Val Phe Ile Leu Glu Glu Gly Ala Thr														
			50				55						60	

Leu Arg Asn Val Ile Ile Gly Ala Asn Gln Arg Glu Gly Ile His Cys  
65 70 75 80

Lys Gly Ser Cys Asn Ile Glu Phe Ala Trp Phe Glu Asp Val Cys Glu  
85 90 95

Asp Ala Ile Ser Ile Leu Gly Ser Gly Thr Ala Asn Ile Ile Gly Gly  
100 105 110

Gly Ala Tyr His Ala Ser Asp Lys Val Ile Gln His Asn Gly Cys Gly  
115 120 125

His Val Asn Ile Val Asn Phe Tyr Ala Asn Asp Tyr Gly Lys Val Tyr  
130 135 140

Arg Ser Cys Gly Asn Cys Lys Gly Asn Thr Asn Cys Lys Arg Ser Val  
145 150 155 160

His Met Glu Gly Thr Thr Ala Val Lys Gly Gly Glu Leu Ile Gly Ile  
165 170 175

Asn Thr Asn Tyr Gly Asp Lys Ala Thr Tyr Ser Asn Asn Cys Tyr Pro  
180 185 190

Lys Thr Gln Cys Gln Gly Tyr Lys Gly Cys Asp Lys Ser Lys Gly Glu  
195 200 205

Cys Glu Pro Ser Lys Ala Ala Lys Cys  
210 215

<210> 8

<211> 347

<212> PRT

<213> *Erwinia carotovora* pv *carotovora*

<400> 8

Met Phe Lys Tyr Leu Thr Pro Ile Phe Leu Cys Thr Ala Ala Ile Ser  
1 5 10 15

Phe Gln Ala Gln Ala Asp Asp Thr Met Leu Met Leu Leu Lys Lys Asp  
20 25 30

Asn Ala Thr Tyr Leu Ser Trp Ser Thr Asp Ala Gly Asn Val Val Arg  
35 40 45

Gln Asp Val Tyr Arg Ser Thr Ser Ser Ala Gln Ala Gly Ser Glu Lys  
50 55 60



Ile	Ala	Glu	Leu	Asn	Ser	Ser	Asp	Arg	Thr	Phe	Thr	Asp	Leu	Thr	Ala	
65					70					75					80	
Asn	Pro	Gln	Ser	Asp	Tyr	Trp	Tyr	Trp	Val	Asp	Thr	Val	Ser	Gly	Asn	
				85					90					95		
Asn	Ser	Val	Leu	Lys	Ser	Asn	Ala	Ala	Ser	Thr	Ala	Pro	Ala	Pro	Leu	
			100					105					110			
Arg	Ala	Ala	Pro	Leu	Lys	Ala	Ala	Ser	Pro	Glu	Cys	Lys	Ala	Gly	Ala	
	115						120					125				
Val	Ile	Lys	Asp	Lys	Thr	Val	Asp	Cys	Gly	Gly	Ile	Thr	Leu	Gly	Leu	
	130					135					140					
Ser	Cys	Ser	Gly	Asp	Ser	Asp	Lys	Gln	Pro	Pro	Val	Ile	Thr	Leu	Glu	
145					150					155					160	
Asn	Ala	Thr	Ile	Lys	Asn	Leu	Arg	Ile	Ser	Glu	Lys	Gly	Gly	Ser	Asp	
				165					170					175		
Gly	Ile	His	Cys	Lys	Ser	Gly	Asn	Cys	Arg	Ile	Glu	Asn	Val	Ile	Trp	
		180						185					190			
Glu	Asp	Ile	Cys	Glu	Asp	Ala	Ala	Thr	Asn	Leu	Gly	Lys	Thr	Met	Thr	
	195						200					205				
Ile	Val	Gly	Gly	Val	Ala	His	Asn	Thr	Thr	Asn	Gly	Pro	Gly	Gly	Lys	
	210					215					220					
Pro	Asp	Lys	Val	Leu	Gln	Gln	Asn	Ala	Lys	Asn	Ser	His	Thr	Ile	Val	
225					230					235					240	
Gln	Gly	Lys	Phe	Thr	Leu	Thr	Gly	Gln	His	Gly	Lys	Leu	Trp	Arg	Ser	
				245					250					255		
Cys	Gly	Asp	Cys	Thr	Asn	Asn	Gly	Gly	Pro	Arg	Asn	Leu	Thr	Ile	Ile	
			260					265					270			
Ser	Ala	Thr	Val	Asn	Gly	Thr	Ile	Asp	Ser	Ile	Ala	Gly	Val	Asn	Arg	
	275						280					285				
Asn	Phe	Gly	Asp	Val	Ala	Glu	Ile	Arg	Asp	Leu	Arg	Ile	Lys	Gly	Tyr	
	290					295					300					
Lys	Glu	Gly	Lys	Pro	Pro	Val	Cys	Glu	Glu	Phe	Asn	Gly	Val	Glu	Lys	
305					310					315					320	

Gly Lys Gly Lys Ser Asp Lys Tyr Gly Glu Phe Trp Asp Thr Lys Asn  
 325 330 335

Cys Lys Val Ser Arg Ser Asn Val Lys Pro Leu  
 340 345

<210> 9

<211> 347

<212> PRT

<213> Erwinia carotovora pv carotovora

<400> 9

Met Phe Lys Tyr Leu Thr Pro Ile Phe Leu Cys Thr Ala Ala Phe Ser  
 1 5 10 15

Phe Gln Ala Gln Ala Asp Asp Thr Met Leu Met Leu Leu Lys Lys Asp  
 20 25 30

Asn Ala Thr Tyr Leu Ser Trp Ser Thr Asp Ala Gly Asn Val Val Arg  
 35 40 45

Gln Asp Val Tyr Arg Ser Thr Asn Asn Ala Gln Ala Gly Ser Glu Lys  
 50 55 60

Ile Ala Glu Leu Asn Ser Thr Asp Arg Thr Phe Thr Asp Leu Thr Ala  
 65 70 75 80

Asn Pro Lys Ser Asp Tyr Trp Tyr Trp Val Asp Thr Val Ser Ser Asn  
 85 90 95

Asn Asn Val Gln Lys Ser Asn Ala Ala Gln Thr Ala Pro Ala Pro Leu  
 100 105 110

Arg Ala Ala Pro Leu Lys Ala Ala Ser Ser Glu Cys Lys Ala Gly Ala  
 115 120 125

Val Ile Lys Asp Lys Thr Val Asp Cys Gly Gly Ile Thr Leu Gly Leu  
 130 135 140

Ser Cys Thr Gly Asp Ser Asp Lys Gln Pro Pro Val Ile Thr Leu Glu  
 145 150 155 160

Asn Ala Thr Ile Lys Asn Leu Arg Ile Ser Glu Lys Gly Gly Ser Asp  
 165 170 175

Gly Ile His Cys Lys Ser Gly Asn Cys Arg Ile Glu Asn Val Ile Trp

180	185	190
Glu Asp Val Cys Glu Asp Ala Ala Thr Asn Leu Gly Lys Thr Met Thr		
195	200	205
Ile Val Gly Gly Val Ala His Asn Thr Thr Asn Gly Pro Gly Gly Lys		
210	215	220
Pro Asp Lys Val Leu Gln Gln Asn Ala Lys Asn Ser His Thr Ile Val		
225	230	235
Gln Gly Asn Phe Thr Leu Thr Gly Gln His Gly Lys Leu Trp Arg Ser		
245	250	255
Cys Gly Asp Cys Thr Asn Asn Gly Gly Pro Arg Asn Leu Thr Ile Ile		
260	265	270
Ser Ala Thr Val Asn Gly Thr Ile Asp Ser Ile Ala Gly Val Asn Arg		
275	280	285
Asn Phe Gly Asp Val Ala Glu Ile Arg Asp Leu Arg Ile Lys Asn Tyr		
290	295	300
Lys Ala Gly Asn Pro Lys Ile Cys Glu Glu Phe Lys Gly Ile Glu Lys		
305	310	315
Gly Lys Gly Lys Thr Glu Lys Tyr Gly Glu Phe Trp Asp Ser Lys Asn		
325	330	335
Cys Lys Val Ser Arg Ser Asn Val Lys Ala Leu		
340	345	

<210> 10

<211> 231

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: consensus of  
SEQ ID NOS: 4-9

<220>

<221> UNSURE

<222> (3)

<223> Xaa at position 3 is Gly, Ser, Pro, or Ala

<220>

<221> UNSURE  
 <222> (5)  
 <223> Xaa at position 5 is Asn, Gly, Asp, or Ser  
  
 <220>  
 <221> UNSURE  
 <222> (6)  
 <223> Xaa at position 6 is Gln, Ala, Val, His, Ser, or  
 Pro  
  
 <220>  
 <221> UNSURE  
 <222> (7)  
 <223> Xaa at position 7 is Thr, Gln, Ile, Lys, or Glu  
  
 <220>  
 <221> UNSURE  
 <222> (9)  
 <223> Xaa at positon 9 is Leu, Phe, Glu, Asn, or Lys  
  
 <220>  
 <221> UNSURE  
 <222> (10)  
 <223> Xaa at position 10 is His, Pro, Ser, or Ala  
  
 <220>  
 <221> UNSURE  
 <222> (11)  
 <223> Xaa at position 11 is Asp, Thr, Lys, Ala, or Gly  
  
 <220>  
 <221> UNSURE  
 <222> (13)  
 <223> Xaa at position 13 is Ile, Val, or Lys  
  
 <220>  
 <221> UNSURE  
 <222> (14)  
 <223> Xaa at position 14 is Thr, Pro, Glu, or Ile  
  
 <220>  
 <221> UNSURE  
 <222> (19)  
 <223> Xaa at positon 19 is Gln, Gly, Asp, Glu, or Val  
  
 <220>  
 <221> UNSURE  
 <222> (20)

<223> Xaa at positon 20 is Val, Ser, Lys, or Asp

<220>  
<221> UNSURE  
<222> (24)  
<223> Xaa at position 24 is Lys or Gly

<220>  
<221> UNSURE  
<222> (25)  
<223> Xaa at position 25 is Gly, Trp, or Met

<220>  
<221> UNSURE  
<222> (26)  
<223> Xaa at position 26 is Gln, Lys, Ala, or Val

<220>  
<221> UNSURE  
<222> (27)  
<223> Xaa at position 27 is Thr, Arg, or Lys

<220>  
<221> UNSURE  
<222> (29)  
<223> Xaa at position 29 is Thr, Glu, Val, or Asp

<220>  
<221> UNSURE  
<222> (31)  
<223> Xaa at position 31 is Gly, Glu, or Asn

<220>  
<221> UNSURE  
<222> (32)  
<223> Xaa at position 32 is Ser, Pro, or Ile

<220>  
<221> UNSURE  
<222> (33)  
<223> Xaa at position 33 is Glu, Lys, Thr, Gly, or Val

<220>  
<221> UNSURE  
<222> (34)  
<223> Xaa at position 34 is Leu, Val, Thr, Ala, or Lys

<220>

<221> UNSURE  
 <222> (36)  
 <223> Xaa at position 36 is Asp, Lys, Ser, or Leu  
  
 <220>  
 <221> UNSURE  
 <222> (39)  
 <223> Xaa at position 39 is Glu, Asp, Tyr, Asn, Ala,  
           Ser, or Thr  
  
 <220>  
 <221> UNSURE  
 <222> (41)  
 <223> Xaa at position 41 is Glu, Thr, Gly, or Asp  
  
 <220>  
 <221> UNSURE  
 <222> (47)  
 <223> Xaa at position 47 is Leu, Met, Ser, Val, or Pro  
  
 <220>  
 <221> UNSURE  
 <222> (60)  
 <223> Xaa at position 60 is Arg or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (64)  
 <223> Xaa at position 64 is Asp, Ala, Arg, or Lys  
  
 <220>  
 <221> UNSURE  
 <222> (65)  
 <223> Xaa at position 65 is Asp, Ser, Asn, or Gly  
  
 <220>  
 <221> UNSURE  
 <222> (66)  
 <223> Xaa at position 66 is Gly, Gln, or Ser  
  
 <220>  
 <221> UNSURE  
 <222> (67)  
 <223> Xaa at position 67 is Ala, Gly, Ser, or Arg  
  
 <220>  
 <221> UNSURE  
 <222> (74)

<223> Xaa at position 74 is Ser or no residue

<220>  
<221> UNSURE  
<222> (76)  
<223> Xaa at position 76 is Asp, Thr, His, Ser, or Asn

<220>  
<221> UNSURE  
<222> (78)  
<223> Xaa at position 78 is Lys, Thr, Asn, or Arg

<220>  
<221> UNSURE  
<222> (93)  
<223> Xaa at position 93 is Thr or no residue

<220>  
<221> UNSURE  
<222> (94)  
<223> Xaa at position 94 is Val, Asn, or no residue

<220>  
<221> UNSURE  
<222> (95)  
<223> Xaa at position 95 is Lys, Leu, or no residue

<220>  
<221> UNSURE  
<222> (96)  
<223> Xaa at position 96 is Pro, Gly, or no residue

<220>  
<221> UNSURE  
<222> (97)  
<223> Xaa at position 97 is Lys, Asn, or no residue

<220>  
<221> UNSURE  
<222> (100)  
<223> Xaa at position 100 is Gly, Lys, or Thr

<220>  
<221> UNSURE  
<222> (101)  
<223> Xaa at position 101 is Lys, Gln, Leu, or Ile

<220>

<221> UNSURE  
<222> (102)  
<223> Xaa at position 102 is Lys, Thr, Ala, Gly, or Val

<220>  
<221> UNSURE  
<222> (105)  
<223> Xaa at position 105 is Val, Thr, or Glu

<220>  
<221> UNSURE  
<222> (106)  
<223> Xaa at position 106 is Ser or Ala

<220>  
<221> TURN  
<222> (107)  
<223> Xaa at position 107 is Glu, Tyr, Thr, Trp, Asn, or His

<220>  
<221> UNSURE  
<222> (109)  
<223> Xaa at position Thr, Asn, or Ile

<220>  
<221> UNSURE  
<222> (114)  
<223> Xaa at position 114 is Glu, Phe, Tyr, or Gly

<220>  
<221> UNSURE  
<222> (123)  
<223> Xaa at position 123 is Leu, Phe, His, or Gln

<220>  
<221> UNSURE  
<222> (126)  
<223> Xaa at position 126 is Asp, Arg, Cys, or Lys

<220>  
<221> UNSURE  
<222> (128)  
<223> Xaa at position 128 is Asn, Thr, His, or Ser

<220>  
<221> UNSURE  
<222> (129)



<223> Xaa at position 129 is Leu, Val, or His  
  
 <220>  
 <221> UNSURE  
 <222> (130)  
 <223> Xaa at position 130 is Ser, His, Asn, or Thr  
  
 <220>  
 <221> UNSURE  
 <222> (133)  
 <223> Xaa at position 133 is Asn, Asp, or Gln  
  
 <220>  
 <221> UNSURE  
 <222> (134)  
 <223> Xaa at position 134 is Gly or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (135)  
 <223> Xaa at position 135 is Lys, Asn, or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (136)  
 <223> Xaa at position 136 is Phe or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (139)  
 <223> Xaa at position 139 is Ala, Val, or Thr  
  
 <220>  
 <221> UNSURE  
 <222> (140)  
 <223> Xaa at position 140 is Lys, Glu, Gln, Asn, or Gly  
  
 <220>  
 <221> UNSURE  
 <222> (146)  
 <223> Xaa at position 146 is Val, Ser, Tyr, or Trp  
  
 <220>  
 <221> UNSURE  
 <222> (153)  
 <223> Xaa at position 153 is Gln, Lys, Glu, or Thr  
  
 <220>

<221> UNSURE  
<222> (154)  
<223> Xaa at position 154 is Gly, Asp, or Asn

<220>  
<221> UNSURE  
<222> (156)  
<223> Xaa at position 156 is Lys, Thr, or Gly

<220>  
<221> UNSURE  
<222> (158)  
<223> Xaa at position 158 is Gly, Cys, or Pro

<220>  
<221> UNSURE  
<222> (159)  
<223> Xaa at position 159 is Pro, Lys, or Arg

<220>  
<221> UNSURE  
<222> (161)  
<223> Xaa at position 161 is Asp, Asn, Ser, or Leu

<220>  
<221> UNSURE  
<222> (163)  
<223> Xaa at position 163 is Asn, Ile, Tyr, or His

<220>  
<221> UNSURE  
<222> (165)  
<223> Xaa at position 165 is Ser, Glu, or Lys

<220>  
<221> UNSURE  
<222> (166)  
<223> Xaa at position 166 is His, Asn, Gly, or Ala

<220>  
<221> UNSURE  
<222> (167)  
<223> Xaa at position 167 is Ile, Ser, Val, or Thr

<220>  
<221> UNSURE  
<222> (170)  
<223> Xaa at position 170 is Glu, Val, Lys, or Gly

<220>  
<221> UNSURE  
<222> (171)  
<223> Xaa at position 171 is Asp, Asn, Lys, or Thr

<220>  
<221> UNSURE  
<222> (173)  
<223> Xaa at position 173 is Lys or no residue

<220>  
<221> UNSURE  
<222> (174)  
<223> Xaa at position 174 is Phe or no residue

<220>  
<221> UNSURE  
<222> (175)  
<223> Xaa at position 175 is Ser or no residue

<220>  
<221> UNSURE  
<222> (176)  
<223> Xaa at position 176 is Phe or no residue

<220>  
<221> UNSURE  
<222> (177)  
<223> Xaa at position 177 is Val or no residue

<220>  
<221> UNSURE  
<222> (178)  
<223> Xaa at position 178 is Lys or no residue

<220>  
<221> UNSURE  
<222> (182)  
<223> Xaa at position 182 is Gly, Cys, Ala, or Ile

<220>  
<221> UNSURE  
<222> (184)  
<223> Xaa at position 184 is Leu, Ile, or Val

<220>  
<221> UNSURE

<222> (186)  
 <223> Xaa at position 186 is Val, Thr, His, Ala, or Arg  
  
 <220>  
 <221> UNSURE  
 <222> (193)  
 <223> Xaa at position 193 is Leu, Lys, Thr, or Glu  
  
 <220>  
 <221> UNSURE  
 <222> (195)  
 <223> Xaa at position 195 is Asp, Ile, Thr, Lys, Ser, or Arg  
  
 <220>  
 <221> UNSURE  
 <222> (196)  
 <223> Xaa at position 196 is Val, Asn, or Asp  
  
 <220>  
 <221> UNSURE  
 <222> (197)  
 <223> Xaa at position 197 is Glu, Ser, Val, Asn, or Leu  
  
 <220>  
 <221> UNSURE  
 <222> (199)  
 <223> Xaa at position 199 is Ile or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (200)  
 <223> Xaa at position 200 is Lys or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (201)  
 <223> Xaa at position 201 is Gly, Asn, or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (202)  
 <223> Xaa at position 202 is Tyr or no residue  
  
 <220>  
 <221> UNSURE  
 <222> (203)  
 <223> Xaa at position 203 is Lys or no residue

<220>  
<221> UNSURE  
<222> (204)  
<223> Xaa at position 204 is His, Gln, Ala, Tyr, or Glu

<220>  
<221> UNSURE  
<222> (205)  
<223> Xaa at position 205 is Tyr, Asp, Asn, or Gly

<220>  
<221> UNSURE  
<222> (207)  
<223> Xaa at position 207 is Val, Gly, Lys, or Pro

<220>  
<221> UNSURE  
<222> (208)  
<223> Xaa at position 208 is Pro, Lys, Gln, or Thr

<220>  
<221> UNSURE  
<222> (209)  
<223> Xaa at position 209 is Met, Tyr, Ser, Lys, Gln,  
Val, or Ile

<220>  
<221> UNSURE  
<222> (211)  
<223> Xaa at position 211 is Ala, Asp, Gln, Thr, or Glu

<220>  
<221> UNSURE  
<222> (212)  
<223> Xaa at position 212 is Asn, Arg, Ala, Met, Gly, or  
Glu

<220>  
<221> UNSURE  
<222> (214)  
<223> Xaa at position 214 is Lys, Glu, Thr, or Asn

<220>  
<221> UNSURE  
<222> (216)  
<223> Xaa at position 216 is Ala, Asn, Cys, Val, or Ile

<220>  
 <221> UNSURE  
 <222> (218)  
 <223> Xaa at position 218 is Ser, Gln, or Lys

<220>  
 <221> UNSURE  
 <222> (221)  
 <223> Xaa at position 221 is Cys or Gly

<220>  
 <221> UNSURE  
 <222> (223)  
 <223> Xaa at position 223 is Pro, Cys, Ser, or Thr

<220>  
 <221> UNSURE  
 <222> (224)  
 <223> Xaa at position 224 is Thr, Pro, Lys, Glu, or Asp

<220>  
 <221> UNSURE  
 <222> (226)  
 <223> Xaa at position 226 is Ile, Phe, Ser, or Tyr

<220>  
 <221> UNSURE  
 <222> (228)  
 <223> Xaa at position 228 is Ser, Pro, Ala, or Glu

<220>  
 <221> UNSURE  
 <222> (229)  
 <223> Xaa at position 229 is Gly, Ala, Cys, or Phe

<220>  
 <221> UNSURE  
 <222> (230)  
 <223> Xaa at position 230 is Pro, Gly, Lys, or Trp

<400> 10  
 Pro Lys Xaa Ala Xaa Xaa Xaa Ser Xaa Xaa Xaa Ala Xaa Xaa Val Lys  
 1 5 10 15

Lys Gly Xaa Xaa Tyr Asp Gly Xaa Xaa Xaa Xaa Phe Xaa Arg Xaa Xaa  
 20 25 30

Xaa Xaa Cys Xaa Gly Gln Xaa Glu Xaa Gly Asp Lys Asp Ala Xaa Phe

35	40	45																	
Ile	Leu	Glu	Glu	Gly	Ala	Thr	Leu	Lys	Asn	Val	Xaa	Ile	Ile	Gly	Xaa				
50					55						60								
Xaa	Xaa	Xaa	Glu	Gly	Ile	His	Cys	Lys	Xaa	Gly	Xaa	Cys	Xaa	Ile	Glu				
65					70					75					80				
Asn	Val	Trp	Trp	Glu	Asp	Val	Cys	Glu	Asp	Ala	Ile	Xaa	Xaa	Xaa	Xaa				
				85					90					95					
Xaa	Thr	Met	Xaa	Xaa	Xaa	Ser	Gly	Xaa	Xaa	Xaa	Ile	Xaa	Gly	Gly	Gly				
			100				105						110						
Ala	Xaa	His	Ala	Ser	Asp	Lys	Val	Leu	Gln	Xaa	Asn	Gly	Xaa	Gly	Xaa				
	115					120						125							
Xaa	Xaa	Ile	Val	Xaa	Xaa	Xaa	Xaa	Phe	Tyr	Xaa	Xaa	Asp	Tyr	Gly	Lys				
130						135						140							
Leu	Xaa	Arg	Ser	Cys	Gly	Asn	Cys	Xaa	Xaa	Asn	Xaa	Gly	Xaa	Xaa	Arg				
145					150					155					160				
Xaa	Val	Xaa	Ile	Xaa	Xaa	Xaa	Val	Ala	Xaa	Xaa	Gly	Xaa	Xaa	Xaa	Xaa				
			165					170				175							
Xaa	Xaa	Gly	Glu	Leu	Xaa	Gly	Xaa	Asn	Xaa	Asn	Tyr	Gly	Asp	Val	Ala				
		180						185				190							
Xaa	Ile	Xaa	Xaa	Xaa	Cys	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Lys	Xaa	Xaa				
	195					200						205							
Xaa	Cys	Xaa	Xaa	Tyr	Xaa	Gly	Xaa	Glu	Xaa	Gly	Lys	Xaa	Glu	Xaa	Xaa				
210						215					220								
Lys	Xaa	Gly	Xaa	Xaa	Xaa	Asp													
225					230														